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FLOOD INSURANCE STUDY

ORIGINAL

COMPLETED
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CITY OF NORTH CANTON, OHIO

STARK COUNTY

MAY 3, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 390521

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Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

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FLOOD INSURANCE STUDY

CITY OF NORTH CANTON,
STARK COUNTY, OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of North Canton, Stark County, Ohio, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of North Canton to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Malcolm Pirnie, Inc. for the Federal Emergency Management Agency, under Contract No. H-4799. This study was completed in January 1981.

1.3 Coordination

On May 9, 1978, the initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the Ohio Department of Natural Resources (ODNR), the City of North Canton and the Study Contractor. At this meeting, the methods of study were outlined, the floodway concept was explained and the stream reaches requiring detailed or approximate study were identified.

During the initial phase of the study, a search for flood data and other relevant information was made at all levels of government and from the general public. Various reports and data pertinent to flooding within North Canton and adjacent communities were obtained from the U.S. Geological Survey (USGS), the U.S. Army Corps of Engineers (COE), the Soil Conservation Service (SCS), the ODNR, the Muskingum Watershed Conservancy District, the Stark County Regional Planning Commission and the Stark County Engineer's Office. Also, a notice was published in the

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Canton Repository on October 6, 1978, explaining the purpose of this study and requesting anyone with information relevant to this Flood Insurance Study to make it available. However, there were no responses to this notice.

During the course of this study, the above-mentioned agencies were consulted often for purposes of coordinating information and to keep them informed of the results of various analyses. Efforts were also made to coordinate the study results with other ongoing and completed Flood Insurance Studies being performed for communities which are adjacent to the study area.

On , the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of North Canton, Stark County, Ohio. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction for the next five years, through January 1986.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards as identified at the initiation of the study. The scope and methods of study were proposed to and agreed upon by FEMA and the City of North Canton.

Floods caused by the overflow of West Branch Nimishillen Creek, McDowell Ditch and Zimber Ditch, within the corporate limits of North Canton, were studied in detail. In addition, Chatham Ditch, from its confluence with West Branch Nimishillen Creek to the Bob-O-Link Golf Course, was also studied in detail. Approximate flood boundaries were determined for Chatham Ditch upstream of the detailed study limits.

2.2 Community Description

The City of North Canton is located in northeastern Ohio in north-central Stark County. It is bordered by the City of Canton to the south and surrounded by unincorporated Stark County on the north, east and west. The total land area contained within the corporate limits is 5.0 square miles. The population of North Canton was listed as 15,228 in the 1970 Census. The projected population of the city is expected to increase to 15,988 by 1985 and 17,897 by the year 2000 (References 1 and 2).

The City of North Canton, founded in 1831, was originally called New Berlin. Beginning as a small agricultural community, the city grew very slowly during the first 60 years. Eventually, the effects of the industrial

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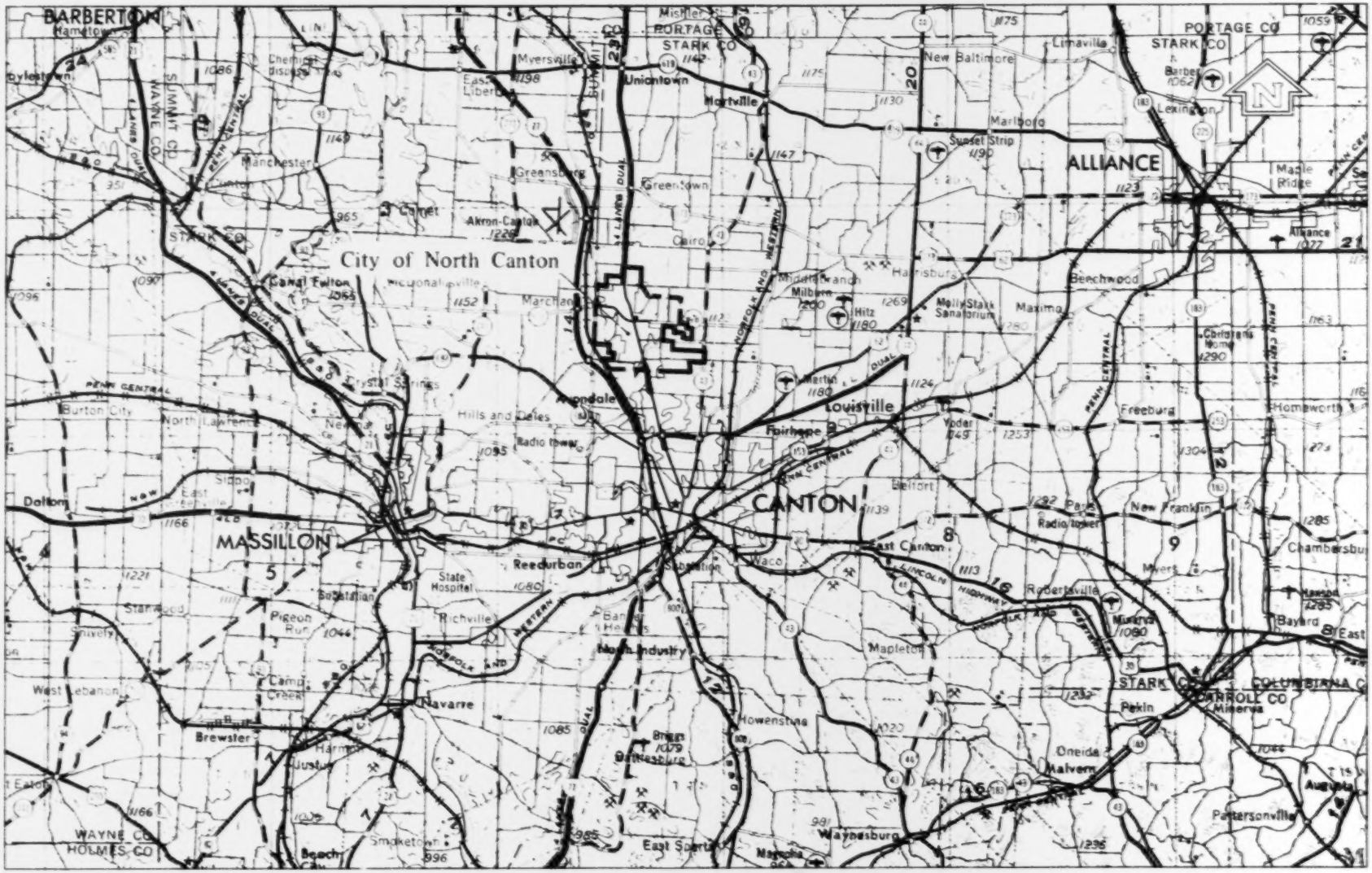

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH CANTON, OH
(STARK CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

boom in nearby Canton traveled north and the city began to grow at a much quicker rate in the early 1900's. It has continued to grow steadily through this century, and today it is both a thriving commercial and residential community with some industrial activity. North Canton is currently the fourth largest city in Stark County (Reference 3).

Lake Erie has considerable influence on the area weather, tempering cold air masses during the late fall and winter, and contributing to heavy snowfall until the lake freezes over. Summers are moderately warm, but quite humid. Area temperatures range from an average monthly high of 71.7 degrees Fahrenheit (F.) in July to an average monthly low of 26.3 degrees F. in January. Average annual precipitation for the Akron-Canton area is 36.4 inches and would be approximately the same for North Canton (Reference 4).

Stark County's topography is a product of continental glaciation during recent geologic time. Over two-thirds of the county has either been covered by ice or buried by glacial outwash deposits. The drainage area of West Branch Nimishillen Creek and its tributaries share Stark County's geographical location in the Allegheny portion of the Appalachian Plateau. The part of the plateau occupied by the West Branch Nimishillen Creek drainage basin is mainly composed of soils formed in glacial till or drift, outwash material transported by glacial melt waters of the Wisconsin Age (Reference 5).

The primary watercourses affecting North Canton are West Branch Nimishillen Creek, Chatham Ditch, McDowell Ditch and Zimber Ditch. West Branch Nimishillen Creek flows south through the eastern portion of the city. Its length of 14 miles extends from its confluence with Nimishillen Creek in Canton, through North Canton and into northern Stark County. Its drainage area encompasses approximately 47 square miles which includes about 15 square miles upstream of North Canton (References 6 and 7). Chatham Ditch is located in the northern portion of the city and discharges into West Branch Nimishillen Creek north of East Maple Street. It has a length of approximately 2.6 miles and a drainage area of about 1.5 square miles. McDowell and Zimber Ditches are located along the western border of North Canton. Zimber Ditch flows into McDowell Ditch just north of Everhard Road at the corporate limits. These two streams extend for a combined length of about eight miles from the confluence of McDowell Ditch with West Branch Nimishillen Creek in Canton to the southern portions of Summit County. The drainage area of McDowell Ditch is about 19 square miles which includes the Zimber Ditch drainage area of about 12 square miles.

The flood plains in North Canton consist mainly of residential and commercial developments.

2.3 Principal Flood Problems

Major floods have occurred within the West Branch Nimishillen Creek drainage basin during all seasons of the year. Most of the past floods have been produced by winter and spring rains falling on ground already saturated, snow-covered, or frozen, thus resulting in a high runoff rate.

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Although these storms are of lesser intensity than the summer and fall rains, they are of longer duration and have greater peak flows. Large floods, however, may occur at any time, particularly on smaller streams.

Flooding has frequently occurred within this drainage basin with the largest known flood occurring in March 1913. Due to the fact that extensive records of floods and river stages were not made at that time, the discharge value associated with this historic flood was not determined in the North Canton area. The largest flood of recent years, as recorded on Nimishillen Creek at USGS gage No. 03118500, located about nine miles downstream of North Canton at North Industry, was on January 21, 1959, and had a discharge of 8,600 cubic feet per second (cfs). Other major floods occurred in September 1979, August 1935 and February 1929 (References 8, 9 and 10).

The principal cause of flooding along West Branch Nimishillen Creek and its tributaries within North Canton is heavy rainfall which creates a runoff beyond the capacity of the natural drainage system. This causes the inundation of areas adjacent to these streams. Potential 100- and 500-year flooding within North Canton is shown in Figures 2, 3, 4 and 5.

2.4 Flood Protection Measures

The flooding sources within the City of North Canton have no existing or proposed flood protection structures. However, nonstructural measures of flood protection have been used to aid in the prevention of future flood damage. In 1978, the city passed a flood plain ordinance which required the lowest floor of newly constructed or substantially improved structures to be elevated to or above the 100-year flood elevation (Reference 11).

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 per cent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one per cent chance of annual occurrence) in any 50-year period is about 40 per cent (four in ten), and for any 90-year period, the risk increases to about 60 per cent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

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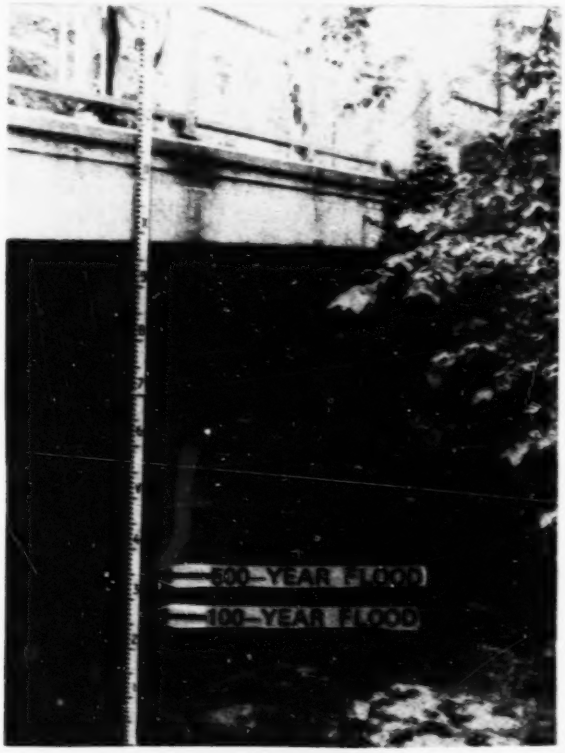

FIGURE 2 - Potential flood elevations at upstream face of South Main Street bridge over West Branch Nimishillen Creek in North Canton.

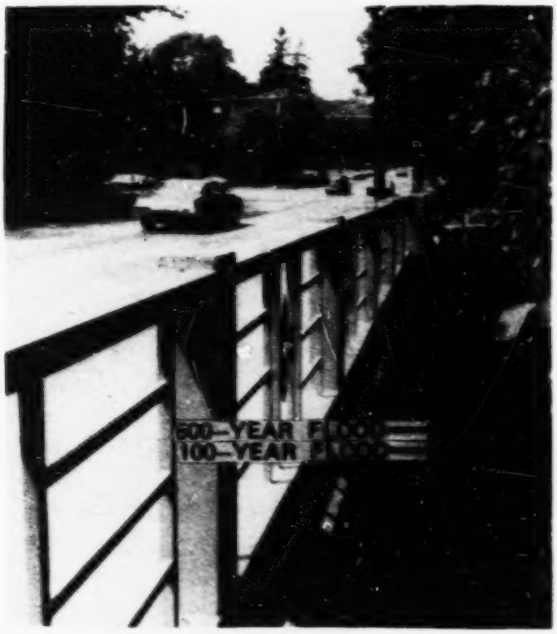

FIGURE 3 - Potential flood elevations at upstream face of South Main Street bridge over West Branch Nimishillen Creek in North Canton.

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FIGURE 4 - Potential flood elevation at downstream face of Everhard Road culvert over McDowell Ditch in North Canton

FIGURE 5 - Potential flood elevation at downstream face of West Glenwood Street bridge over Zimber Ditch in North Canton

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Discharge-frequency relationships for West Branch Nimishillen Creek and Chatham, McDowell and Zimber Ditches within North Canton were developed using the method outlined in Bulletin No. 45 , Floods in Ohio, Magnitude and Frequency (Reference 10). The procedures described in Bulletin No. 45 involve the use of regression equations to calculate peak flood discharges for the 10-, 50- and 100-year frequency events. The regression equations for this area are based on a regional analysis using multiple regression techniques and data obtained from 14 gaging stations located within the Tuscarawas River Basin upstream from Stillwater Creek. They incorporate the parameters of drainage area and channel slope, which had been found to be significant. The 500-year peak flood discharges were estimated using a log-probability distribution based on the 2-, 10-, 50- and 100-year peak flood dischages.

In areas of high intensity development, an adjustment factor was applied to the discharge values obtained from the regression equations to account for the effects of urbanization. The adjustment was based on a USGS urban hydrology report which evaluated the effects of storm sewered areas, impervious areas and rainfall quantity and intensity (Reference 12).

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
WEST BRANCH NIMISHILLEN CREEK					
South Main Street	16.9	1,100	1,670	1,940	2,640
Schneider Street	15.6	989	1,520	1,770	2,420
East Maple Street	14.9	908	1,410	1,650	2,300
Downstream from Chatham Ditch	13.8	873	1,360	1,600	2,210
North Canton corporate limit	12.4	812	1,270	1,490	2,070
CHATHAM DITCH					
Marquardt Avenue	1.4	204	343	413	600
MCDOWELL DITCH					
Everhard Road	13.9	1,010	1,520	1,780	2,420
ZIMBER DITCH					
Chessie System	12.1	955	1,430	1,680	2,280
Glenwood Street	11.7	894	1,360	1,580	2,150
Whipple Avenue	9.8	681	1,060	1,250	1,730

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3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Cross sections used in the backwater analyses of West Branch Nimishillen Creek and Chatham, McDowell and Zimber Ditches were obtained from topographic maps at a scale of 1:2400 with two-foot contour intervals (References 13 and 14). The channel bottom profile was obtained by field measurement. All bridges, dams and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Roughness factors for the main channels generally range from 0.011 to 0.060 depending upon the characteristics of the channel bottom, with flood plain roughness values ranging from 0.025 for cleared overbanks to 0.150 for high density housing and heavily wooded overbanks.

Flood elevations of the 10-, 50-, 100- and 500-year floods for reaches studied in detail were developed using the COE HEC-2 step-backwater computer model (Reference 15). The starting water-surface elevations for these streams were calculated using the slope-area method. The hydraulic computations on West Branch Nimishillen Creek were started downstream of the confluence of McDowell Ditch, south of the city's corporate limits. The hydraulic computations on McDowell, Zimber and Chatham Ditches were started at their confluence with West Branch Nimishillen Creek.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The flood boundaries along that portion of Chatham Ditch studied by approximate methods were determined from an analysis of the detailed study results downstream of this area and from normal depth calculations using Manning's and Continuity equations. The Flood Hazard Boundary Map previously published (Reference 16) and the USGS published Floodprone Area Map (Reference 17) were used whenever possible to aid in the delineation of the approximate 100-year flood boundaries.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using topographic maps at a scale of 1:2400 with two-foot contour intervals (References 13 and 14).

For the stream studied by approximate methods, the boundary of the 100-year flood was developed using the analysis outlined in the previous section and the topographic maps referenced above.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of

the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2). Portions of the floodway on the West Branch Nimishillen Creek and Chatham, McDowell and Zimber Ditches are outside of the corporate limits.

As shown on the Flood Boundary and Floodway Map, the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 6.

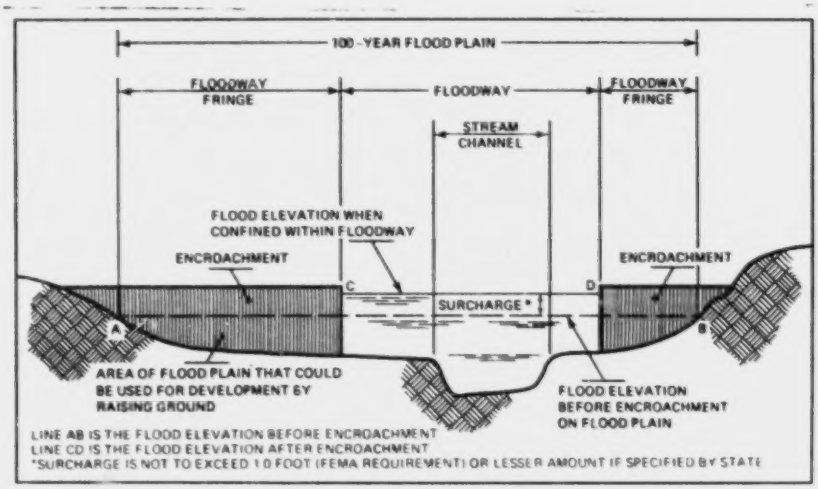
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 6 - Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
WEST BRANCH NIMISHILLEN CREEK								
A	32,016	103	442	4.4	1065.3	1065.3	1066.2	0.9
B	32,656	94	299	6.5	1067.1	1067.1	1067.8	0.7
C	33,727	59	394	4.9	1074.0	1074.0	1074.3	0.3
D	35,001	60	424	4.6	1076.4	1076.4	1076.7	0.3
E	36,794	61	502	3.5	1079.6	1079.6	1079.9	0.3
F	38,488	95	671	2.6	1084.8	1084.8	1084.8	0.0
G	43,231	80	498	3.3	1088.8	1088.8	1089.6	0.8
CHATHAM DITCH								
A	75	17	101	4.1	1090.4	1086.5[3]	1087.5	1.0
B	765	35	150	2.7	1090.4	1088.8[3]	1089.6	0.8
C	1565	32	82	5.1	1092.6	1092.6	1092.6	0.0
D	2333	26/0[2]	128	3.2	1100.4	1100.4	1100.5	0.1
E	2733	22	84	4.9	1100.5	1100.5	1101.3	0.8
McDOWELL DITCH								
A	8163	274	1902	0.9	1055.7	1055.7	1056.6	0.9
ZIMBER DITCH								
A	186	53/25[2]	586	2.9	1063.7	1063.7	1064.3	0.6
B	2914	276	1601	1.0	1064.1	1064.1	1065.1	1.0
C	4034	252	1766	0.9	1064.2	1064.2	1065.2	1.0

[1]FEET ABOVE MOUTH
[2]TOTAL WIDTH / WIDTH WITHIN CORPORATE LIMITS
[3]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM WEST BRANCH NIMISHILLEN CREEK

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH CANTON, OH
(STARK CO.)

FLOODWAY DATA

WEST BRANCH NIMISHILLEN CREEK -
CHATHAM DITCH - McDOWELL DITCH - ZIMBER DITCH

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5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the City of North Canton.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 per cent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the City of North Canton are shown on the Flood Profiles and are summarized in Table 3, "Flood Insurance Zone Data."

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of North Canton was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

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Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A2-A5:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of North Canton is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

Flood Insurance Studies are currently in progress for the unincorporated areas of Stark County and the City of Canton, Ohio which surrounds the City of North Canton, Ohio, and are fully compatible with this study (References 18 and 19).

A Flood Hazard Boundary Map has been published for the community (Reference 16). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
WEST BRANCH NIMISHILLEN CREEK							
REACH 1	0002,0004	–2.0	–0.6	1.3	020	A4	VARIES–SEE MAP
CHATHAM DITCH							
REACH 1	0002	–1.6	–0.6	0.5	015	A3	VARIES–SEE MAP
REACH 2	0002	–1.1	–0.6	1.1	010	A2	VARIES SEE MAP
McDOWELL DITCH							
REACH 1	0003	–2.2	–0.6	1.2	020	A4	VARIES–SEE MAP
ZIMBER DITCH							
REACH 1	0001,0003	2.7	–0.9	1.3	025	A5	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH CANTON, OH
(STARK CO.)

FLOOD INSURANCE ZONE DATA

WEST BRANCH NIMISHILLEN CREEK -
CHATHAM DITCH - McDOWELL DITCH - ZIMBER DITCH

BEST DOCUMENT AVAILABLE

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 300 South Wacker Drive, (24th Floor), Chicago, Illinois 60606.

8.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, 1970 Census of Population, Volume One - Characteristics of the Population Part One - United States Summary Section One, 1971.

2. Stark County Regional Planning Commission, 2000 Land Use Plan, 1980.

3. ————, An Inventory of Historical Sites and Structures, January 1976.

4. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, Local Climatological Data, Annual Summary with Comparative Data, Akron, Ohio, 1977.

5. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey, Stark County, Ohio, October 1971.

6. State of Ohio, Department of Natural Resources, Division of Water, Gazetteer of Ohio Streams, 1960.

7. ————, Drainage Areas of Ohio Streams, Supplement to Gazetteer of Ohio Streams, 1967.

8. ————, Bulletin No. 32, Floods in Ohio, Magnitude and Frequency, 1959.

9. ————, Bulletin No. 43, Floods in Ohio, Magnitude and Frequency, April 1969.

10. ————, Bulletin No. 45, Floods in Ohio, Magnitude and Frequency, May 1977.

11. City of North Canton, Ohio, Zoning Ordinances, Ordinance No. 87-78.

12. U.S. Geological Survey, Water Resources Division, An Approach to Estimating Flood Frequency for Urban Areas in Oklahoma, July 1974.

13. Photogrammetric Services, Inc., Stark County Aerial Topographic Maps, T11 R8 Sections 7, 8, 9, 16, 17, 18, 19, 20 Plain, T11 R9 Sec. 1, 12, 13 Jackson, Scale 1:2400, Contour Interval two feet: Stark County Engineer, Canton, Ohio, 1970.

14. American Air Surveys, Inc., City of Canton Aerial Topopgraphic Maps, Map Nos. One and Two, Scale 1:2400, Contour Interval two feet: Office of City Civil Engineer, Canton, Ohio, 1966.

15. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, November 1976.

16. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of North Canton, Ohio, May 1974.

17. U.S. Geological Survey, Map of Floodprone Areas, Scale 1:24000, Contour Interval 10 feet: North Canton, Ohio, 1972.

18. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Stark County, Ohio, (in progress).

19. ———, Flood Insurance Study, City of Canton, Ohio, (in progress).

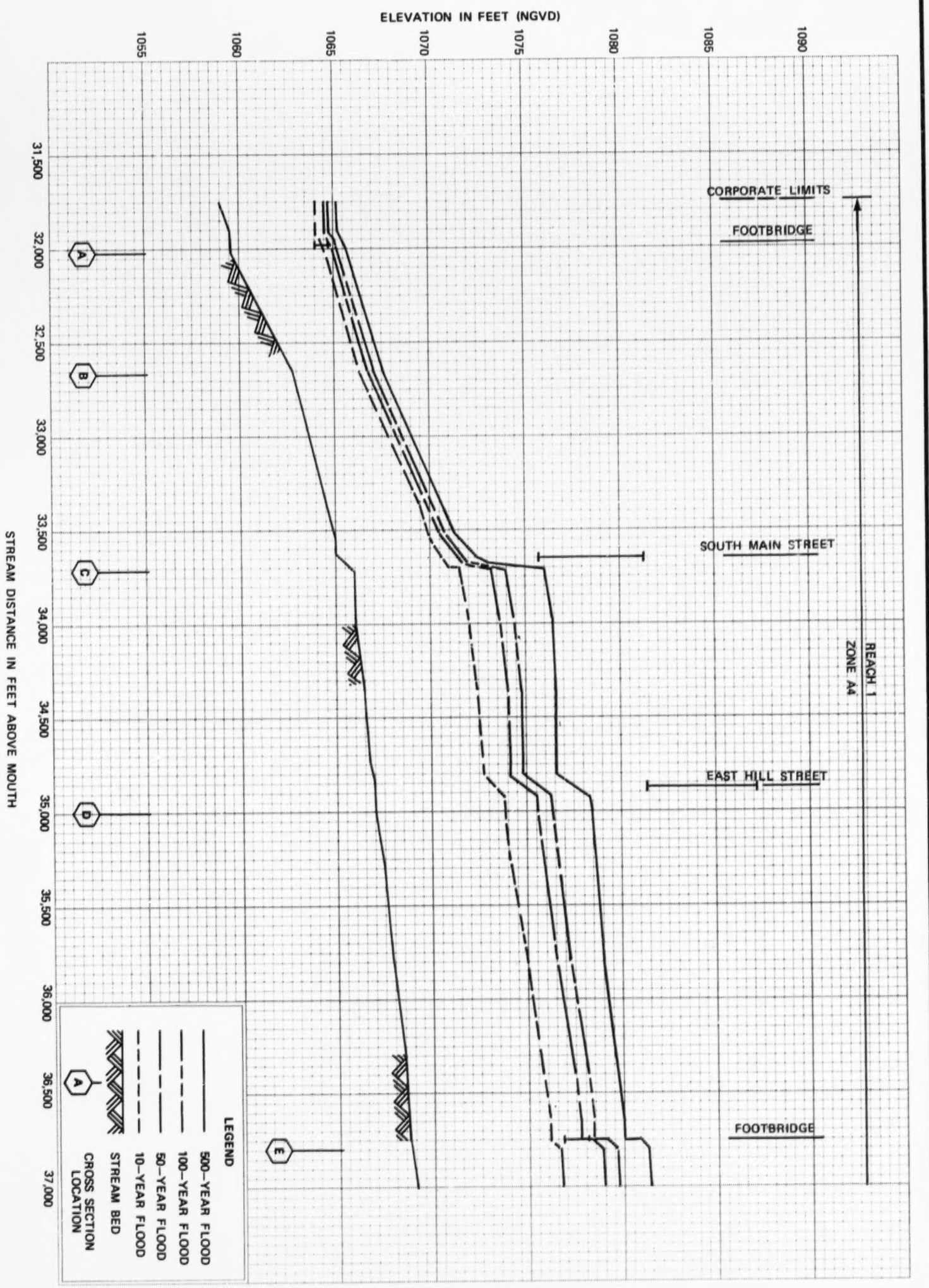
Chow, Ven Te, Open Channel Hydraulics, New York: McGraw-Hill Book Company, Inc., 1959.

Stark County Engineer, Storm Drainage Facility Plan, Parts One and Two, Stark County, Ohio, 1970.

U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 10 feet: North Canton, Ohio, 1978.

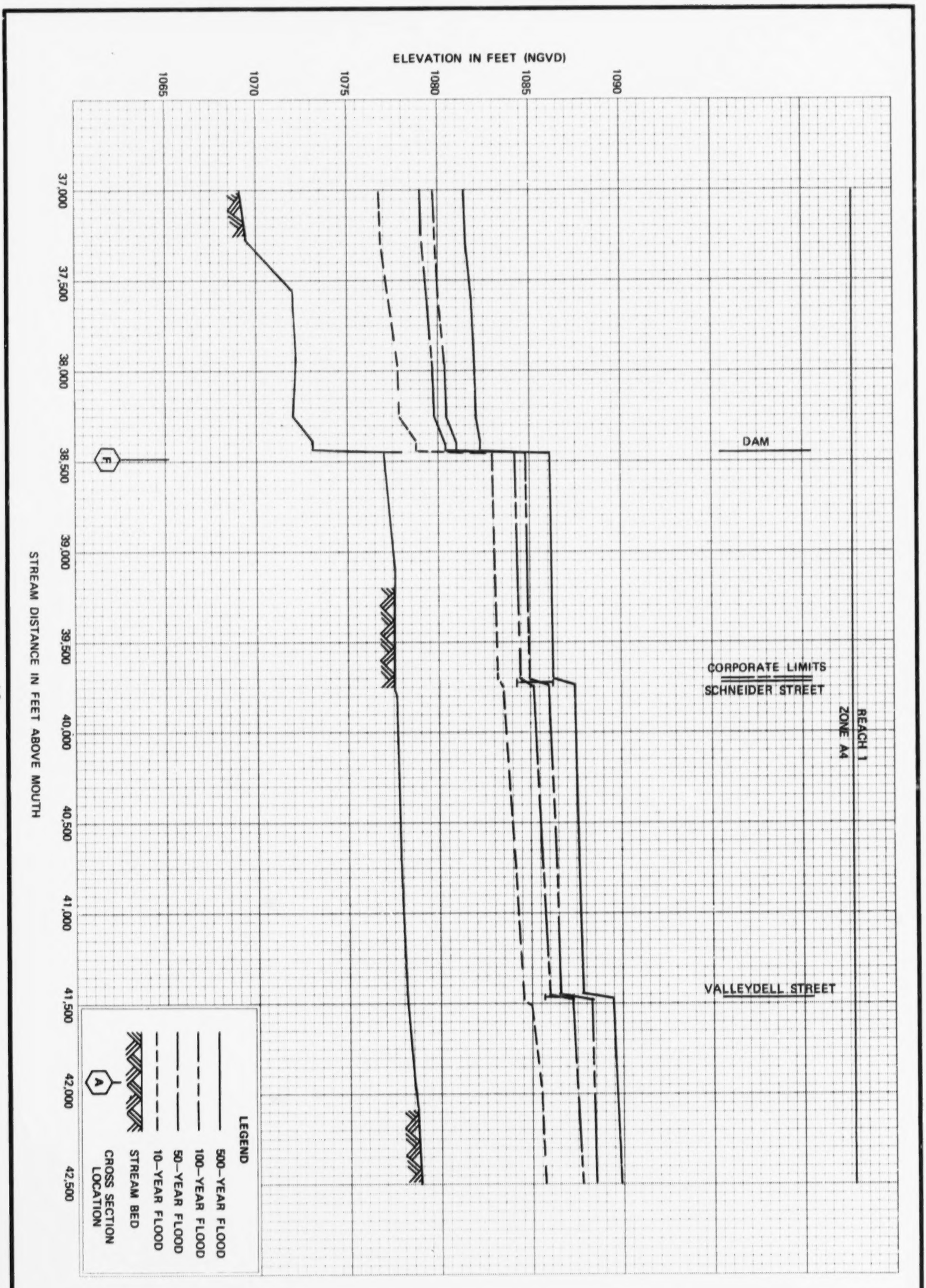
———, Roughness Characteristics of Natural Channels, Water Supply Paper 1849, 1967.

U.S. Water Resources Council, Bulletin No. 17A, Guidelines for Determining Flood Flow Frequency, June 1977.



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF NORTH CANTON, OH (STARK CO.)	FLOOD PROFILES WEST BRANCH NIMISHILLEN CREEK

BEST DOCUMENT AVAILABLE



02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH CANTON, OH
(STARK CO.)

FLOOD PROFILES

WEST BRANCH NIMISHILLEN CREEK

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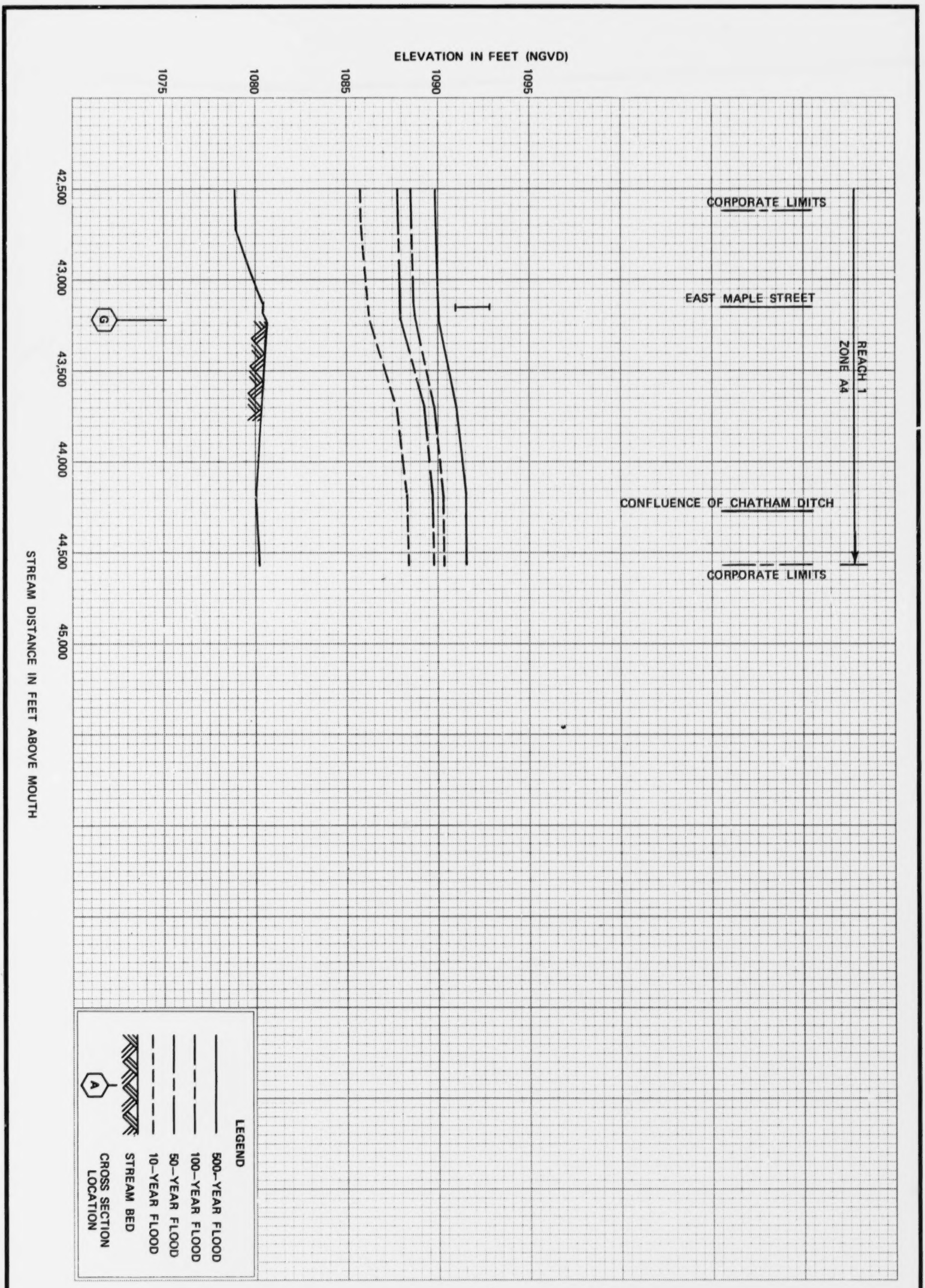


03P

FEDERAL EMERGENCY MANAGEMENT AGENCY

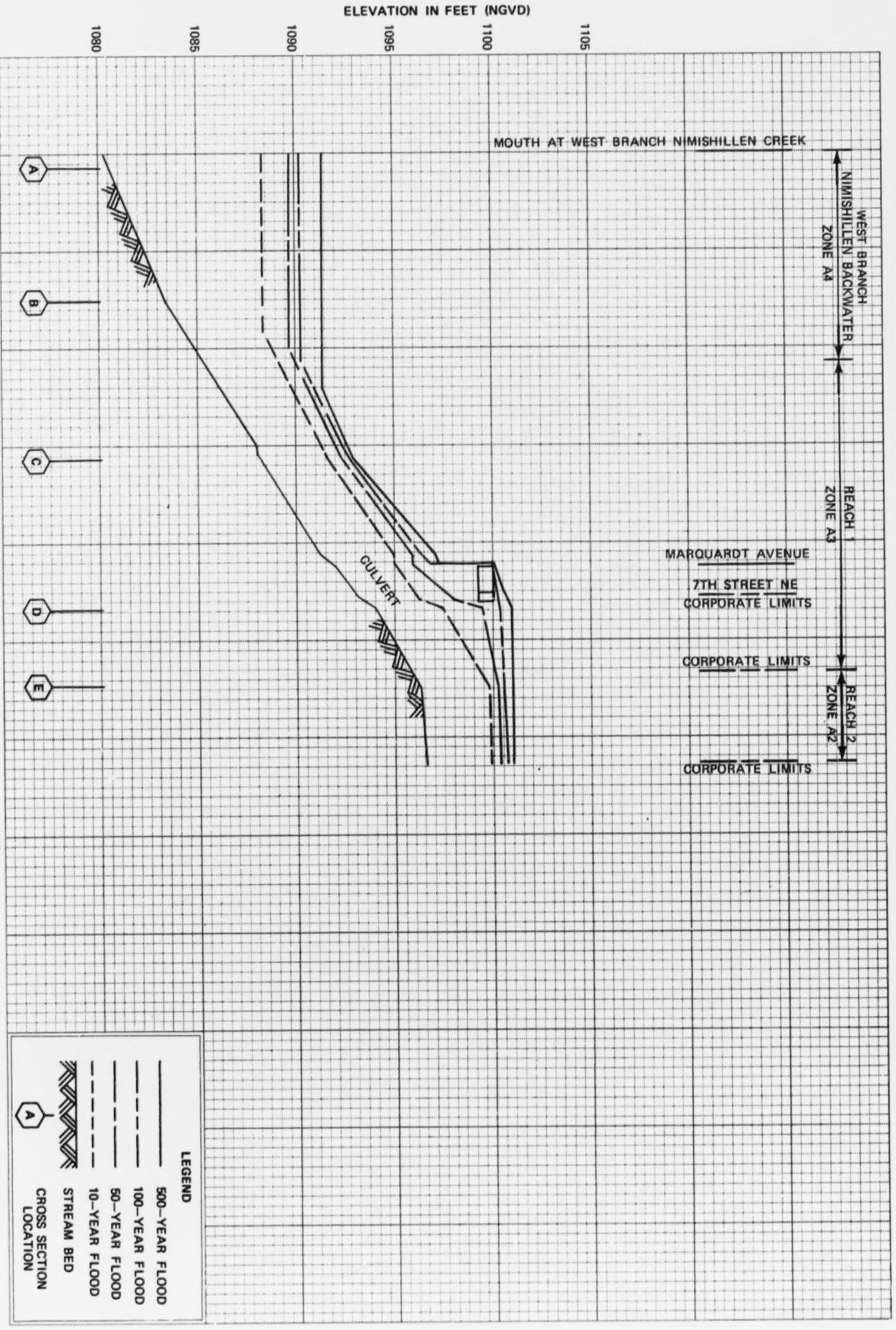
CITY OF NORTH CANTON, OH
(STARK CO.)

FLOOD PROFILES

WEST BRANCH NIMISHILLEN CREEK

20

BEST DOCUMENT AVAILABLE



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04P

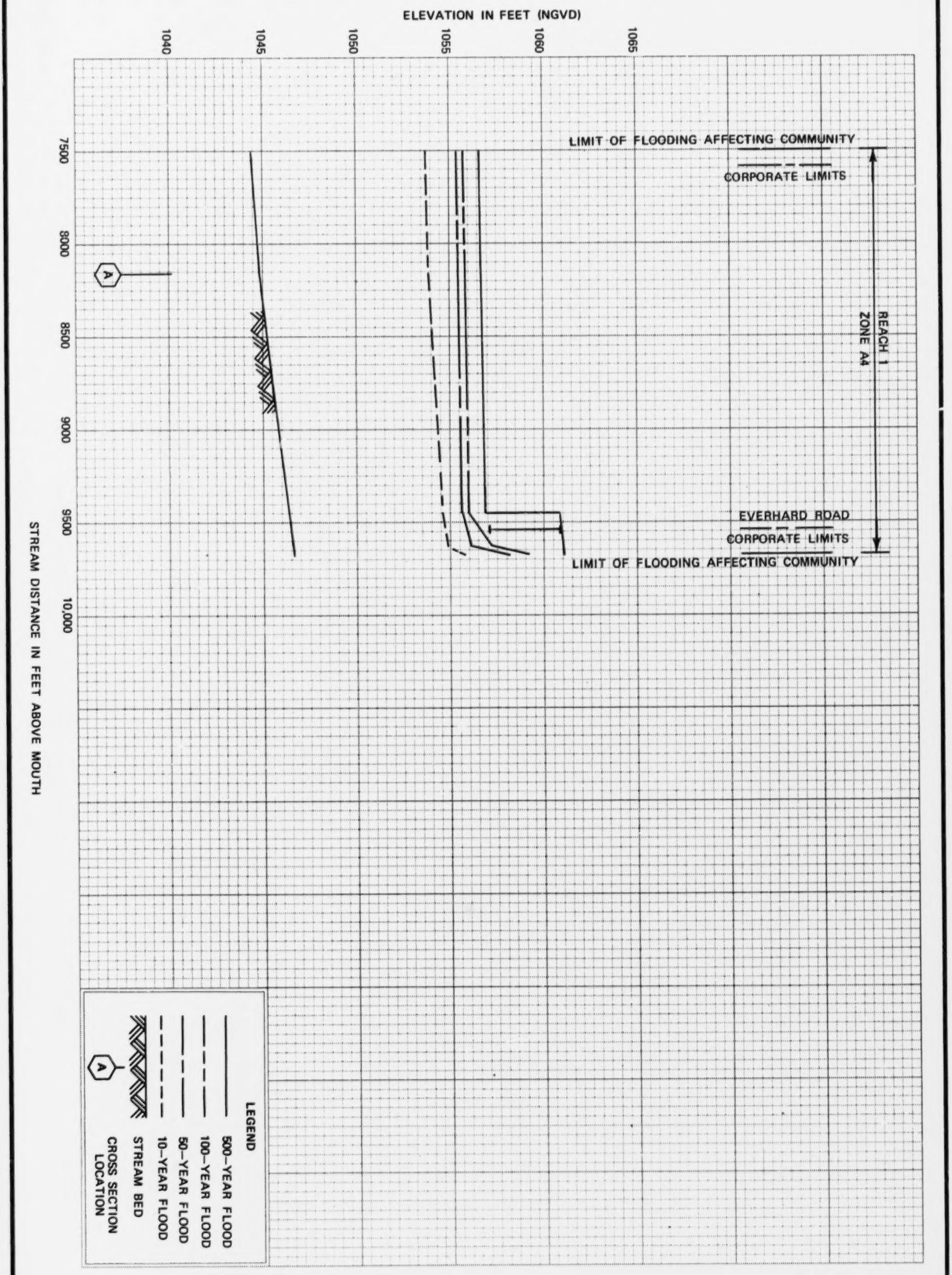
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH CANTON, OH
(STARK CO.)

FLOOD PROFILES

CHATHAM DITCH

BEST DOCUMENT AVAILABLE



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05P

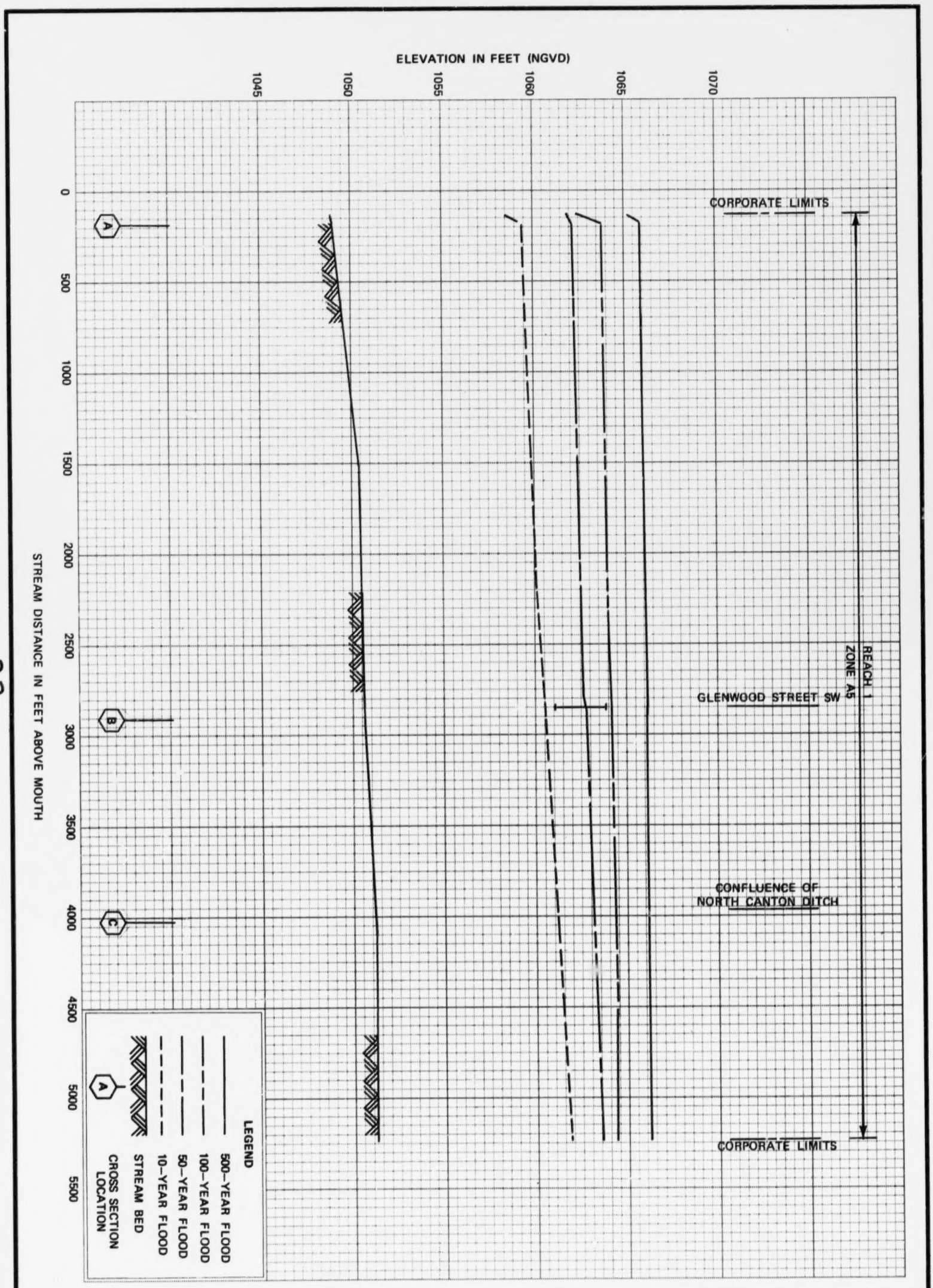
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH CANTON, OH
(STARK CO.)

FLOOD PROFILES

McDOWELL DITCH

BEST DOCUMENT AVAILABLE



06P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF NORTH CANTON, OH (STARK CO.)	FLOOD PROFILES ZIMBER DITCH

BEST DOCUMENT AVAILABLE